UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

July 11, 2017

Jack Oman
Atlantic Richfield Company
4 Centerpointe Drive
La Palma, CA 90623

RE: Enhanced Evaporation, Arimetco Operable Unit (OU-8)
Administrative Order on Consent, Docket No. 09-2009-0010
Anaconda Copper Mine Site

Dear Jack:

EPA has received and reviewed your letter and attachments dated June 5, 2017, regarding the Arimetco heap leach fluid management system (FMS) and your proposal to implement enhanced evaporation in response to the results of recent operational analyses. EPA recognizes the current evaporation pond capacity issues and the challenges in managing the fluid levels in light of accumulating solid precipitates and this past year's above average precipitation. EPA also recognizes the utility of enhanced evaporation as a tool to ensure, at least in the near term, adequate pond capacity for the potential 25-year, 24-hour design storm event.

EPA understands that your specific proposal, described in the attachment entitled *"Addendum 1 to the Arimetco Heap Leach Fluid Management System Operations and Maintenance Plan Yerington Mine Site July 16, 2010"* (FMS O&M Plan), can address some of the shortcomings of the 2016 enhanced evaporation pilot performed by SPS. EPA can support aspects of your plan as an extension of the previous pilot test with the goal of demonstrating process implementation while ensuring minimal environmental impact. EPA does have critical design and implementation issues about this "expanded pilot test" that must be addressed before operations can commence. Among those issues, EPA would require the inclusion of adequate air (moisture and particulate) monitoring in the plan (see attached technical comments). In addition, EPA is providing some peer review comments for your consideration.

In conclusion, EPA conditionally approves Addendum 1 to the FMS O&M Plan, conditioned upon ARC including adequate monitoring in the plan and engaging with EPA to address other identified technical comments. EPA authorizes ARC to initiate preparations for the project.

Thank you very much for your proposal. EPA looks forward to continuing working with you on the OU-8 project.

Sincerely,

Dante Rodriguez, P.E.
Anaconda Project Manager
U.S. EPA Region 9

Cc (via email only):
Jeryl Gardner, NDEP
Dave Davis, BLM
Ginny Hatch, YPT
Peggy Pauly, YCAG

COMMENTS
on
"FMS O&M Plan Addendum," and
"Arimetco Fluid Management System Water Balance Model Update"

TECHNICAL ISSUES

Arcadis. 2017. *Addendum 1 to the Arimetco Heap Leach Fluid Management System Operations and Maintenance Plan, Yerington Mine Site, July 16, 2010. 2017 Arimetco FMS Enhanced Evaporation System.*

1. Catch Basin. EPA agrees with the plan to install a lined catch basin beneath the spray nozzles. We have questions, however, about closing it at the end of the season. What should we do if we want to perform the same enhanced evaporation in subsequent years? The Brown and Caldwell FMS modeling report states that *"spray evaporation of at least 1 MG in 2017 will maintain pond capacity through 2020"* (p. 11), indicating a one-time event. On the other hand, the SPS report (p. 26) presents design criteria to achieve evaporation of 1.5-2.0 MG per year, suggesting annual events. Considering these two assertions, it is not clear whether more than one campaign of enhanced evaporation will be needed or not, but it might be prudent to assume that it is a possibility. Will closing the catchment basin at the end of the 2017 enhanced evaporation season as proposed (by placing a liner atop the basin and covering with native materials) make that area unusable in the future?

2. Solid Particulates. Page 2, item #1, bottom. The referenced Figure 1 is the BETE trajectory modeling plot (although it is not labeled with a figure number. This plot appears to show predicted travel distance of water droplets for P120 nozzles and conditions of 5 ft discharge height, 40 psi pressure, 70F temperature, and 20 mph (29.33 ft/s) wind speed. Our concern, however, is how far would solids left after a water droplet evaporates travel compared to water droplets? Is there a chance that solids could drift for a longer distance? The desiccant beads identified on page 2, item #3, presumably won't be able to evaluate solids drift. We need to consider the possibility of solids drift, as this is the concern expressed by neighbors. We believe that some amount of particulate monitoring would assist in addressing this concern.

3. Wind Monitoring. Page 2, item #3. EPA agrees with the plan to have a wind direction and speed monitoring system installed atop the VLT HLP. We would like some more details about the design and O&M procedures associated with the wind data. For example, will the data be continuously transmitted to a location where it can be regularly monitored, or will someone have to go out and look at a local display? How frequently will the data be observed and evaluated? Were alarms considered to alert an operator of out-of-spec conditions? The text says that the system must be shut down manually if the wind speed exceeds 20 mph; what about if there are elevated wind speeds of 20 mph or even less but in a direction other than the prevailing one, and where there is less than half the catchment basin distance (30 ft versus 65 ft in the prevailing wind direction)?

PEER REVIEW

Arcadis. 2017. *Addendum 1 to the Arimetco Heap Leach Fluid Management System Operations and Maintenance Plan, Yerington Mine Site, July 16, 2010. 2017 Arimetco FMS Enhanced Evaporation System.*

4. Page 1, paragraph 2, bottom. The sentence *"SPS measured an evaporation efficiency of 54% during the pilot-scale test (i.e., for every 100 gallons processed through the system, 54% was evaporated)"* is apparently something of a misinterpretation. The SPS pilot study report actually indicates the following:

- The estimated total fluid volume evaporated during the study, including enhanced evaporation and natural evaporation = 1,215,699 gal evaporated/2,265,699 gal of total VLT fluids= 53.7%.
- The total volume evaporated during the study attributed to the enhanced evaporation system was 662,450 gal or 54.5% of the total volume evaporated (1,215,699 gal). The total evaporated volume attributed to natural evaporation was 533,246 gal, or 45.5% of the total volume evaporated (note: the SPS report rounds these percentages off to 54% and 46%).
- The SPS report does not give any estimate of the enhanced evaporation efficiency in terms of volume evaporated per volume pumped through the system. However, if the volume reported to be evaporated by the enhanced evaporation system is accepted as accurate, and it is divided by the reported total volume pumped to the system (from Table 8-1 of the SPS report), the calculated evaporation efficiency = 662,450 gal/942,250 gal = 70.3%.
- The calculated efficiency value above seems very high and it is not known if it is realistic or not; we recommend that it be checked by consulting evaporation literature, evaporation equipment suppliers, etc. The evaporation calculations presented by SPS seem fairly rough and could include considerable uncertainty (see comments on the pilot study report below).
- It should also be noted that SPS reports running the enhanced evaporation pilot system between noon and 2:00 p.m. (to maximize evaporation), whereas Arcadis proposes to run the full-scale system in late morning (to avoid high winds); consequently, the evaporation efficiency achieved by the full-scale pilot will likely be lower than that achieved in the pilot study, due to generally lower temperature and higher humidity.

5. Page 2, item #1, bottom. The referenced Figure 1 is apparently the BETE trajectory modeling plot, although it is not labeled with a figure number. This plot appears to show predicted travel distance of water droplets for P120 nozzles and conditions of 5 ft discharge height, 40 psi pressure, 70F temperature, and 20 mph (29.33 ft/s) wind speed. What is the difference between the two curves shown?

6. Page 2, item #2. The calculation presented here might underestimate the duration required for an enhanced evaporation system to evaporate 1.9 MG because it neglects to consider evaporation efficiency. For example, (192 gal/min)(60 min/h)(3 h/d)(4 d/week)(14 wk)/(10^6 gal/MG) = 1.94 MG – matching the 1.9 MG target. But, multiplying that value by the presumed evaporation efficiency of 0.54 yields only 1.05 MG.

SPS. 2016. *Summary Report – Enhanced Evaporation Pilot Test, Anaconda Mine Site, Yerington, Nevada.*

7. Pages 17-19, Section 8.2; Table 8-2, evaporation estimates. SPS estimated evaporation using the following equation:
Start volume (FMS Pond) + Pond inflow - Enhanced Evap - Natural Evap = End volume (FMS Pond)

Rearranging the equation gives:
Total evap = Start volume + Inflow - End volume

Where: total evap = enhanced evap + natural evap.

It appears that natural evap is defined as evaporation from the FMS pond surface, although this is not clearly specified. Is this correct?

Total evap volume was calculated from the initial and final pond volumes and the inflow volume. It is implied that the enhanced evap volume was then calculated but it is not clear how. This is implied because Table 8-2 states that the natural evap volume was calculated by difference (i.e., total evap volume - enhanced evap volume). Do you know how SPS calculated the enhanced evaporation volume?

Brown and Caldwell. 2017. *Arimetco (OU-8) Fluid Management System Water Balance Model Update.*

8. Figure 5-4. It isn't clear how/why implementing 1 or 2 MG of enhanced evaporation in 2017 would result in a projected decrease in the level of precipitated solids in the bottom of Ponds B and C, as indicated by this figure. Seems like implementing enhanced evaporation would reduce the incremental accumulation of salt but not reduce the pre-existing amount.

9. Sectio n 6, p. 11 (bottom). States that no sensitivity analyses have been performed for climate or material property variables, etc. Are any planned? This is typically done and may be important for evaluating the effectiveness of the GoldSim model.